

SBN Program Status

Peter Wilson – SBN Program Coordinator

Oversight Board

12 June 2020

Outline

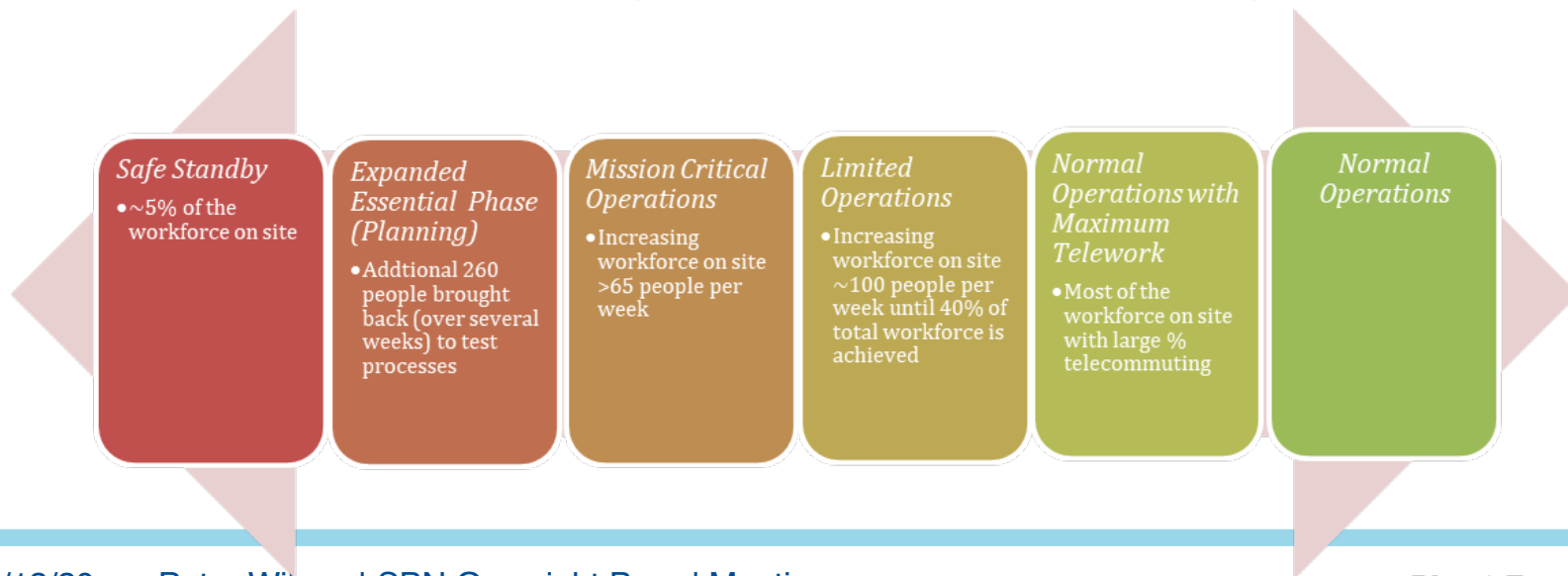
- COVID 19 closure and reopening
- ICARUS technical progress
- SBND technical progress
- SBND Feb 2020 Director's Review

COVID 19: Fermilab closure

- Fermilab went to Safe State of operations at end of the day on March 20
 - Many people already working from home for at least a week
 - About 120-150 essential personnel on-site workdays from March 23 to May 20
 - Limited list of personnel (employees and users) allowed access to site
 - Others must request “Day Pass” at least one day in advance through division management.
 - Essentially all on-site experiment work suspended (e.g. no beams)
 - Only on-site SBN operation: filling of ICARUS (see later slides)
 - Most SBN engineering activities continued remotely
 - Long term residents accommodated in Village (~ 80 people) but no new people
- COVID 19 Safety
 - Must maintain social distancing of >6 ft (2m)
 - Must wear a mask when indoors (except alone in an office)
 - If can't maintain >6ft, additional PPE and Hazard Analysis are required
 - Occupancy rules on elevators, conference rooms
- In May added screening process for entry onsite including questions and temperature scan

COVID 19: Fermilab re-opening

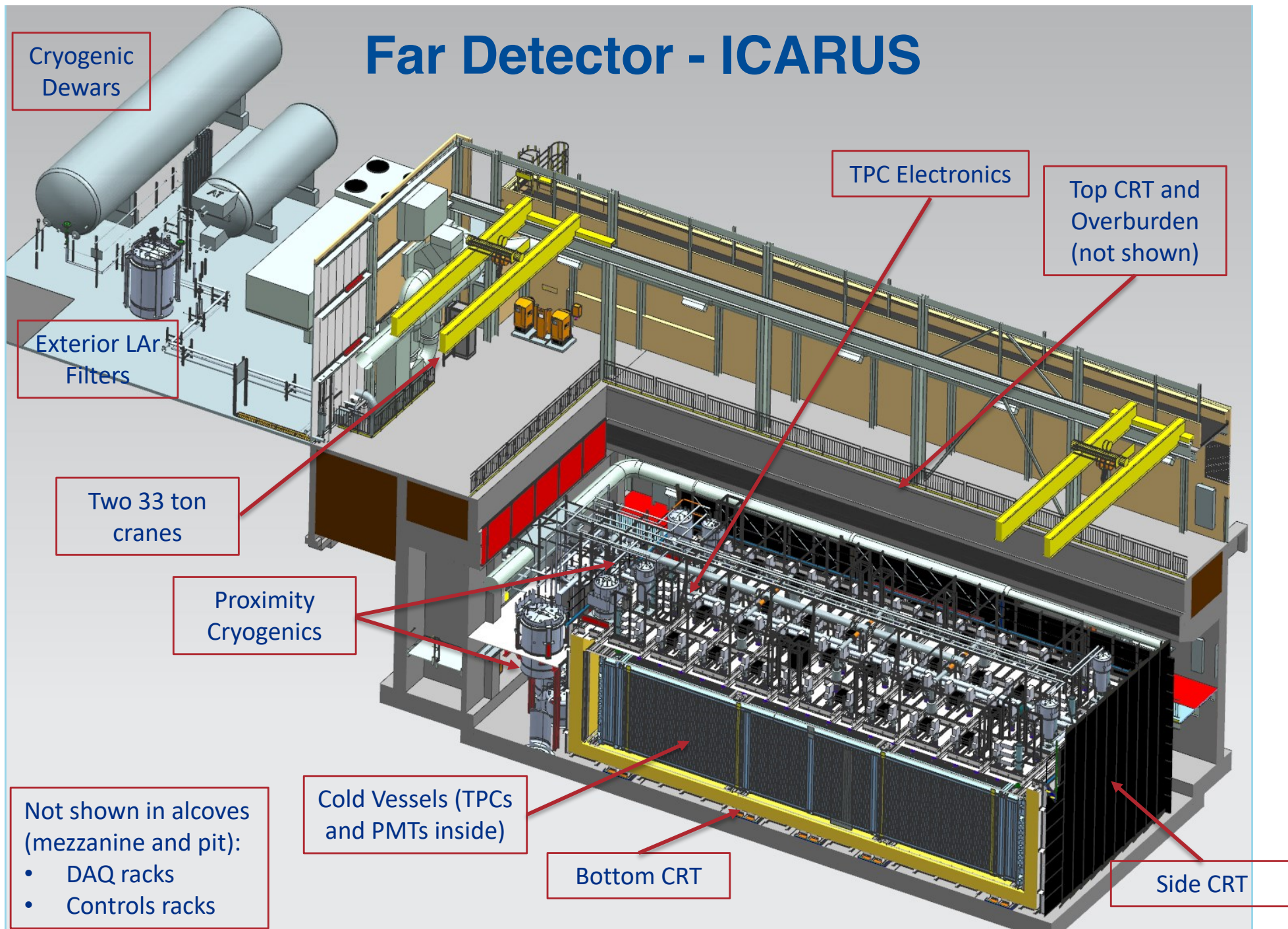
- Planning process
 - Coordinated plan across Fermilab organizations
 - Synched with State of Illinois rules
 - Synched with Argonne National Lab
 - Approved by DOE
 - Peter Wilson is Neutrino Division representative to planning process
- Re-opening plan: slowly add personnel to Essential Personnel list
 - Initially no more than 65 people add per round, rounds at least 1 week apart
 - Evaluate how systems are working between each round
 - Prepare to halt and possibly go back if epidemic in area gets worse



COVID 19: reopening and coordination of work

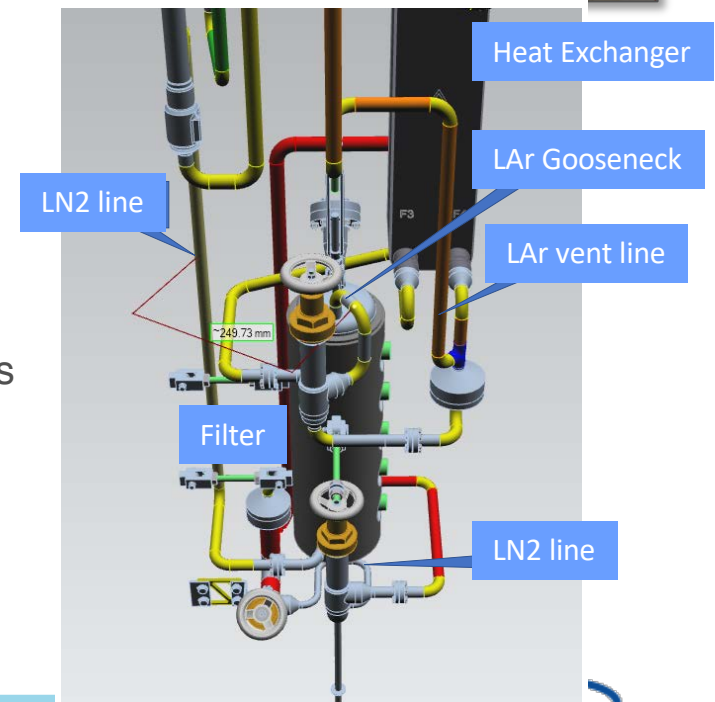
- Gradual reopening started May 21
 - Added about 65 people / week across the lab to the list of essential personnel
 - Completed 4th round this week
 - Pausing to evaluate before next round
- Work must be carefully planned to ensure additional safety rules are followed
 - Avoid conflicts of too many jobs at one time
 - Each facility has point of contact with responsibility for the daily/weekly plan in the facility
 - Authority to say work can proceed based on safety plans, scheduling etc
 - SBN FD (ICARUS): Carrie McGivern
 - SBN ND (SBND): Roberto Acciarri
 - Dzero (SBND Assembly): Pete Simon (Joseph Zennamo)
 - Weekly planning meetings set priorities for the upcoming week

Far Detector - ICARUS



ICARUS Cryogenics Commissioning

- ✓ Met schedule defined in December despite COVID 19
 - ✓ Thank you to Steve Brice for making LA filling a priority with laboratory management
 - ✓ CERN and INFN participation daily via Zoom
- ✓ Completed fill in April
- ✓ Completed ullage pressurization test in April
- ✓ Turned on LAr circulation pumps in April
- ✓ Turning on gas re-condensers (2/vessel)
 - ✓ SW 4/22
 - ✓ NE 4/25
 - ✓ NW 5/1
 - SE condenser still a work in progress
 - Have operated for as long as 4 consecutive days (last week)
 - Gaining experience – very sensitive to details of startup process
 - Designing a modification to address vapor lock in gooseneck between heat exchanger and filter
- Topped off vessels with LAr on May 20



LAr Deliveries



Fritz Schwartz – Weekdays
(Standard face shield for cryogenics)
Roza Doubnik - Weekends



Gas analyzer system

7 days/week receive LAr from Air Products

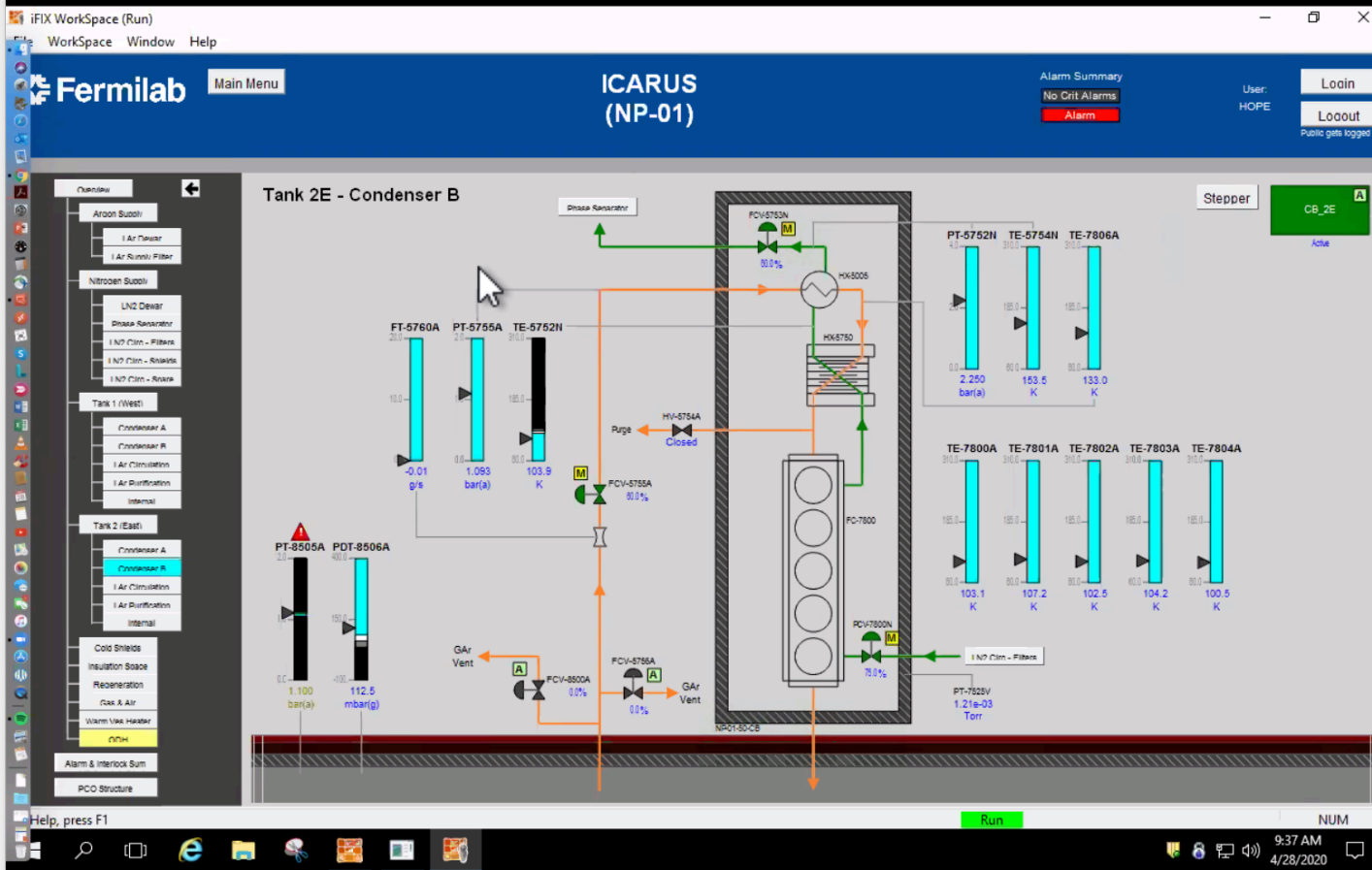
- Truck from plant in Granite City, Illinois arrives about 8-10am every morning
- Neutrino Division engineer
 - Samples Argon before offload for O₂, N₂, H₂O
 - Supervises offload (1-3 hours)
- Daily Feb 24 – Apr 10 with 3 day pause in mid-March for filter regeneration
 - Continues under COVID 19 with social distancing and additional facial coverings; 2nd person monitors over Zoom and Facetime
- Thanks to ND engineers and procurement!



Roza Doubnik – with addition of face mask

Cryogenics Commissioning during COVID-19

Cryogenics commissioning team in action



CERN (@ home in France)

Johan Bremer
Michel Chalifour
Caroline Fabre

Fermilab

Roza Doubnik (not shown)
Michael Geynisman (@ SBN FD)
Chris James (not shown)
Fritz Schwartz (not shown)

INFN

Claudio Montanari (@ SBN FD)
Chiari Vignoli (@ home in Italy)

ICARUS Detector Commissioning – COVID 19 Plan

- Work expanded in last week of May with return of several Fermilab technicians and several key Fermilab personnel: Linda Bagby, Geoff Savage, Donatella Torretta
- Weekly planning meeting (previously organized by the Installation Coordinator, Aria Soha) resumed by the ICARUS Experiment Liaison Officer (ELO), Carrie McGivern, in very close coordination with Claudio Montanari
 - Work plans reviewed and scheduled
 - Work is coordinated to ensure social distancing
 - Ensure that necessary site access permissions are in place

ICARUS Detector Commissioning – COVID 19 Plan

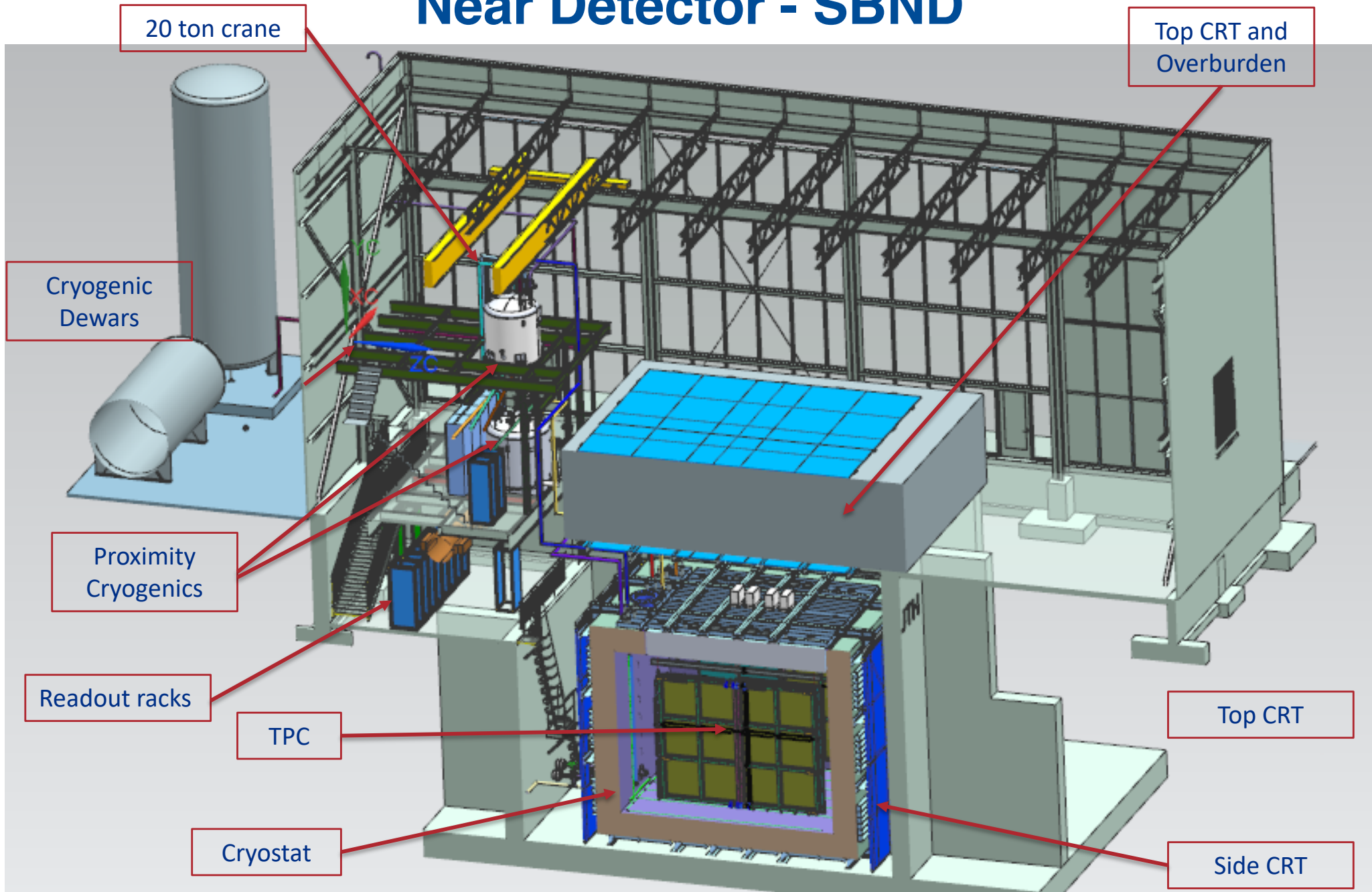
- Initial task list:
 - Transition cryogenics from commissioning to operations – **in progress**
 - Diagnosis of short between detector and building ground – **significant progress - still in process**
 - Partial turn-on of PMT system – **last week 8 PMTs/vessel**
 - Complete TPC drift HV installation - **in progress**
 - Complete TPC bias voltage connections - **in progress**
 - Complete TPC DAQ connections
 - Turn-on Drift HV at up to 40kV (75kV nominal operating voltage)
- Next tasks (likely to start in July)
 - CRT wall installation
- Have not yet made a schedule projection for completion of commissioning tasks. Goal is to be ready for beam when it returns in the fall

ICARUS Milestones to I-2 Detector Filled

Intermediate Milestone	Owner	Baseline Date	Forecast Date		Actual Date
Cold shield cooldown complete	C. Montanari	7-Aug-2019		✓	18-Feb-2020
Vessels filled & ullage pressurization completed	M. Geynisman	30-Sept-2019		✓	22-Apr-2020
Drift HV operational	Z. Williams	15-Oct-2019	18-May-2020		
PMTs operational	G. Raselli	30-Oct-2019	25-May-2020		
Cryogenics commissioning complete	M. Geynisman	30-Nov-2019	29-May-2020		
Cosmic tracks are observed in the TPC	A. Fava	30-Nov-2019	08-Jun-2020		
I2: detector is filled with liquid argon and ready for physics commissioning (LAR purity adequate for physics has been achieved)	P. Wilson	30-Nov-2019	08-Jun-2020		

COVID 19 impact on detector commissioning not yet included

Near Detector - SBND



SBND Assembly at DZero

- Work has continued by collaborators and engineers TPC on designs and assembly plans
 - Contract has been placed for fabrication of the CPA support beam
 - Delivery in early July
 - Design of connections between APA and support beam finalizing
 - Completed first iteration of all procedures for assembling the detector
- Work restarted at Dzero in end of May
 - Completing atf, completed final welding
 - Assembled atf clean tent frames
 - Work by collaborators expected to start at the end of June



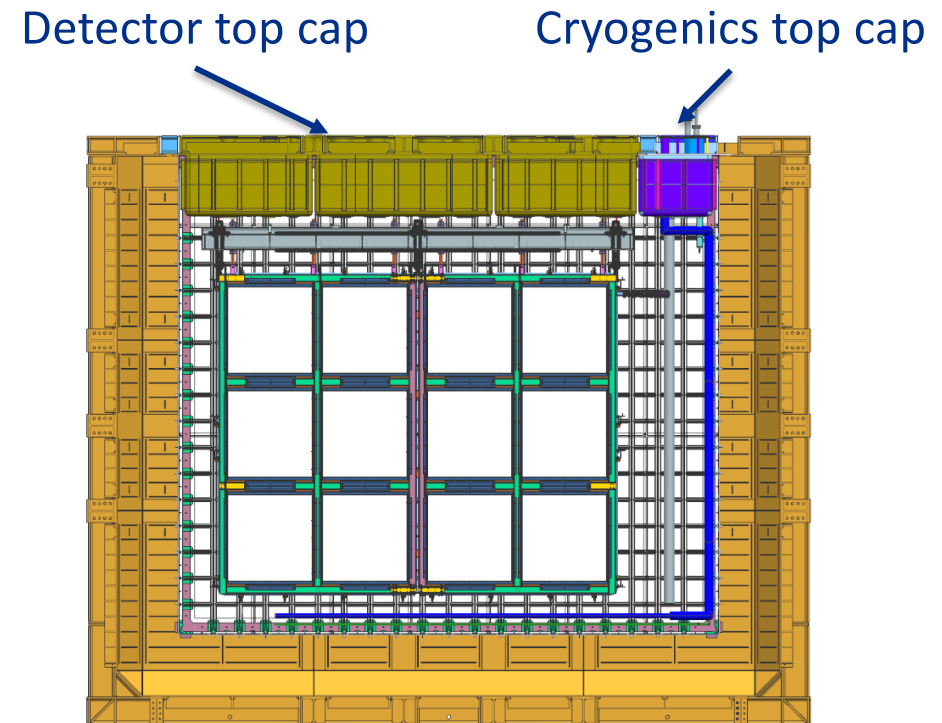
atf with clean tent frames on each side

SBND Installation

- Activities which took place during the last month:
 - Cryostat decking and stair design completed and approved. Procurement in progress.
 - Cryostat railing design completed and approved
 - Pit False Floor design completed. Engineering Note in preparation.
 - Contract for the 3D scan of the warm vessel interior walls placed with the same company who performed the task for FD (Exact Metrology).
- Tasks paused or not started until the end of the Safe State mode:
 - 3D scan of the warm vessel interior walls
 - Commissioning of the Sump Pump monitor panel
 - Cryostat leak check
 - Production and installation of stair and first stage of cryostat decking
 - Planning to restart installation work in July

SBND Cryostat

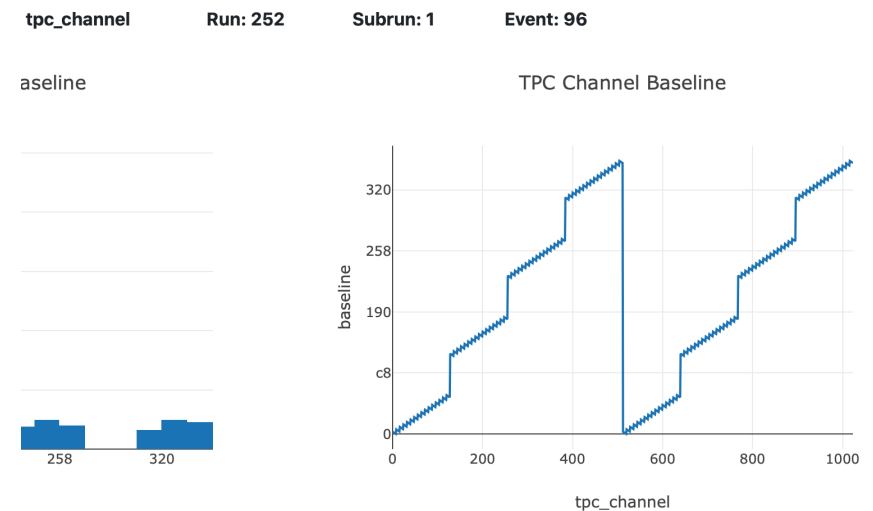
- Membrane materials order placed by CERN at end of March
 - Delivery to Fermilab from vendor in South Korea at end of November
- Cryostat Top caps
 - Flanges ordered by CERN
 - Fabrication paused @ CERN
 - Do not expect to restart until late summer – need technicians to return from outside France/Switzerland
 - Delivery to Fermilab delayed 4-6 months
- **The cryostat is on the critical path**



Cryogenics top cap fabrication

SBND DAQ

- Just time for the COVID 19 shutdown:
 - Installation of the Photon Trigger Board (PTB) rack at SBN-ND, including safety review
 - Installation of hardware and software for slow controls in the five populated electronics racks
 - Started acceptance tests of TPC electronics
 - Started integration tests of TPC readout and PTB
 - Setup system to maximize remote control capabilities
- Significant readout testing progress as remote activity
 - In May, first (mostly) successful run of the WOW "WIB on Wheels".
 - First attempts at running with multiple TPC readout crates and multiple DAQ servers
- Continue implementing a WIB Board Reader for configuration of WIB/PTC/FEMBs



SBND Electronics Installation

- Mezzanine racks installation:
 - All racks in position
 - AC Switch and Rack Protection Units production and assembly completed
- Racks equipment (Rack protection, power distribution, slow control units installed)
- TPC readout installation – readout crates, all the fans, PCIe cards, readout fibers and clock cables, power supplies – installed by the NEVIS Columbia team with FNAL support
 - Passed Operation Readiness Clearance (ORC)
- Ground monitor in place and passed ORC



SBND Schedule re-plan - completed

- Before February Director's Review
 - ✓ Updated TPC assembly plan based on Sept 2019 CRR recommendations
 - ✓ Updated cryogenics resources based on FD lessons and cryostat schedule
 - ✓ Updated labor resource needs based on past experience at DAB (SBND) and SBN-FD (ICARUS)
 - ✓ Updated membrane cryostat procurement schedule to projection as of January
- After Director's Review (completed in April)
 - ✓ Advanced cryogenics engineering based on additional funds this year
 - ✓ More detailed cryogenics control plan
 - ✓ Addressed review recommendations on reviewing assembly and installation plans
 - ✓ Advanced completion of SBND by about 4.5 months
- Unfortunately shutdowns at Fermilab, CERN and Universities will result in delay relative to that plan

SBND Milestones to S-1 SBND ready to move

Intermediate Milestone	Owner	Baseline Date	Forecast Date (Schedule)		Actual Date
First set of APAs shipped to Fermilab	K. Mavrokoridis	24-Sept 2018		✓	4-Mar-2019
PO for COTS ADCs placed	H. Chen	10-Oct-2018		✓	30-Oct-2018
All TPC Components at Fermilab	K. Mavrokoridis	1-Mar-2019		✓	27-Mar-2019
Complete atf assembly at DAB	J. Zennamo	1-May-2019		✓	27-Nov-2019
50% of motherboards delivered to Fermilab	H. Chen	15-May-2019		✓	22-May-19
APAs and CPAs installed in atf	N. McConkey/ J. Zennamo	15-Jun-2019	26-Oct-2020		
Field cage assembly complete	N. McConkey/ J. Zennamo	15-Jul-2019	25-Nov-2020		
Cold electronics installed and tested	H. Chen	23-Aug-2019	7-Jan-2021		
S1: TPC ready to move to SBN ND	A. Schukraft	30-Aug-2019	7-Jan-2021		

These forecasts reflect the updated schedule at end of April but will need to be updated to reflect reality of COVID 19 delays

Upcoming Events

- Operational Readiness Review for SBN FD (ICARUS) – date under discussion
- Director's mini-review of SBND schedule – September/October 2020

Backup